

FORM PTO-1390 (Modified)
(REV 10-95)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

APV 30918

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/341637

INTERNATIONAL APPLICATION NO.
PCT/NL98/00051INTERNATIONAL FILING DATE
23 January 1998PRIORITY DATE CLAIMED
23 January 1997

TITLE OF INVENTION

METHOD AND APPARATUS FOR STRIP-COATING A METALLIC STRIP-SHAPED SUBSTRATE WITH A
PLASTIC BAND AND STRIP THUS OBTAINED

APPLICANT(S) FOR DO/EO/US

Petrus Cornelis Jozef BEENTJES

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

Copy of PCT application as filed (and published application with cover page and International Search Report)
Copy of PCT application as amended during International Stage

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.492 (a)) 09/341637	INTERNATIONAL APPLICATION NO. PCT/NL98/00051	ATTORNEY'S DOCKET NUMBER APV 30918
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20. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :				CALCULATIONS PTO USE ONLY	
<input checked="" type="checkbox"/> Search Report has been prepared by the EPO or JPO \$840.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00 <input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00 <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$840.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$130.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	6 - 20 =	0	x \$18.00	\$0.00	
Independent claims	1 - 3 =	0	x \$78.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$970.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>				\$0.00	
SUBTOTAL =				\$970.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$970.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL FEES ENCLOSED =				\$970.00	
				Amount to be refunded	\$
				charged	\$

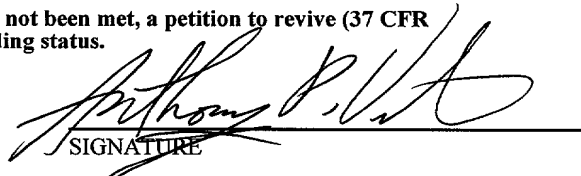
- ☒ A check in the amount of **\$970.00** to cover the above fees is enclosed.
- ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4375** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Anthony P. Venturino
STEVENS, DAVIS, MILLER & MOSHER, L.L.P.
1615 L STREET, N.W., SUITE 850
WASHINGTON, D.C. 20036
TEL. 202-785-0100 / FAX. 202-408-5200

THE APPLICANT HEREWITH PETITIONS
 THE PTO TO EXTEND THE TIME FOR
 RESPONSE AS REQUIRED TO MAKE THE
 ATTACHED DOCUMENT TIMELY FILED.
 PLEASE CHARGE THE COST THEREOF
 TO DEPOSIT ACCOUNT 19-4375


 SIGNATURE

Anthony P. Venturino

NAME

31,674

REGISTRATION NUMBER

July 15, 1999

DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application

Petrus Cornelis Jozef BEENTJES

Serial No.: U.S. National Phase of Int'l Appln. No.
PCT/NL98/00051, filed January 23, 1998

Filed: July 15, 1999

For: METHOD AND APPARATUS FOR STRIP-COATING A METALLIC STRIP-SHAPED
SUBSTRATE WITH A PLASTIC BAND AND STRIP THUS OBTAINED

PRELIMINARY AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

The application as filed includes amendments made during the International Stage. Thus, prior to the calculation of the filing fee, please amend the above-identified application, by further amending the claims amended during the International Stage, as follows:

IN THE CLAIMS

Please amend the following claims.

Claim 2, line 1, change "characterised in that" to --wherein--.

Claim 4, line 1, change "characterised in that" to --wherein--.

Claim 5, line 1, change "Claims 3 or 4, characterised in that" to --Claim 3, wherein--.

Please add new Claim 14 as follows.

--14. Apparatus in accordance with Claim 4, wherein the means of conveying substrate, the contact roll, the means of casting, the cooling roll and the means of feeding and guiding are

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essentially duplicated, one set on each side of where the substrate is situated during operation for simultaneously two-sided coating the substrate.--

REMARKS

Claims 1-5 were previously amended in the International Preliminary Examination Report (IPER). The claims have been amended to delete the multiple dependent claim status. Early and favorable consideration of this application is respectfully requested.

Respectfully submitted,

Date: July 15, 1999

By: Anthony P. Venturino
Anthony P. Venturino
Registration No. 31,674

APV/aes
ATTORNEY DOCKET NO. APV 30918

STEVENS, DAVIS, MILLER & MOSHER, L.L.P.
1615 L STREET, N.W., SUITE 850
WASHINGTON, D.C. 20036
MAILING ADDRESS - P.O. BOX 34387
WASHINGTON, D.C. 20043
TEL. 202-785-0100 / FAX. 202-408-5200

THE APPLICANT HEREWITH PETITIONS
THE PTO TO EXTEND THE TIME FOR
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ATTACHED DOCUMENT TIMELY FILED.
PLEASE CHARGE THE COST THEREOF
TO DEPOSIT ACCOUNT 19-4375

STEVENS DAVIS MILLER & MOSHER, L.L.P.

09/341637

Entire specification
Art. 34

69 Rec'd PCT/PTO 15 JUL 1999

METHOD AND APPARATUS FOR STRIP-COATING A METALLIC STRIP-SHAPED SUBSTRATE WITH A PLASTIC STRIP AND STRIP THUS OBTAINED

The invention relates to a method for strip-coating a metallic strip-shaped substrate with a thin strip of plastic, an apparatus for carrying out the method as well as to the coated strip obtained with the method.

There are at least two methods known for manufacturing a coated product comprising a metal substrate and a plastic layer adhering to it, namely film-laminating and extrusion-coating.

In the case of film-laminating, a finished plastic film is unrolled and applied onto the metal substrate, as disclosed in e.g. WO 93/24324.

In the case of extrusion-coating a sheet of plastic is applied onto the metal substrate directly or virtually directly from an extruder, as disclosed in e.g. EP 0 067 060 A1.

In the case of the first method a roll of finished film is taken as starting material. A problem in making a roll of film is rolling it up. The film tends to stick to itself so that the windings cling to each other. Because in its rolled up state the film shrinks somewhat, the roll has to be rolled up loosely to enable it to be unrolled once again in a controlled way. Inevitable stresses in the film then easily cause edge build-up, the roll becomes unround, and the film displays spacing tracks when being unrolled. Among other things this makes the film incapable of being unrolled without difficulty at a sufficiently high speed; if this does succeed then there remains the problem that at higher rolling off speeds electrostatic discharge symptoms need to be reckoned with. To avoid such difficulties additives are added to for example household foils; in the case of film-lamination this solution offers

AMENDED SHEET

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no remedy because the additives unacceptably reduce the capacity to adhere to the metal substrate.

On the face of it extrusion-coating would therefore seem an interesting alternative, and so it is for a small number of applications, namely those whereby the plastic involved has the correct adhesion properties in molten state. When this is no longer the case, or not adequately so, and molecules need to be incorporated in the plastic to migrate to the surface in order to accomplish adhesion, in the case of extrusion-coating the problems occur, at least where a high coating speed is desired. This is because adhesion groups only migrate fast enough, i.e. within tenths of a second, if a sufficiently high temperature can be maintained during the coating. This is only possible when coating onto one side of the substrate. The required high temperature then also makes it impossible subsequently to coat the other side because the previously applied coating becomes unacceptably damaged on the second exposure to the high temperature. Even non-subsequent but simultaneous two-sided extrusion-coating is no solution because in the case of extrusion-coating the slightest deviation in substrate thickness and the slightest disturbance in the process would cause unstable process operation and consequently coating differences and inhomogeneities on each side.

The problems surrounding the procedures outlined are resolved or at least largely reduced if worked in accordance with the invention.

The method in accordance with the invention is characterised in that it comprises in combination the stages

- (i) in-situ casting of a plastic strip;
- (ii) leading the plastic strip around a preferably internally water-cooled cooling roll;
- (iii) leading away the plastic strip until the plastic strip production is underway and

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stabilised;

- (iv) bringing the plastic strip and the substrate up to speed and heating the substrate to a temperature of the substrate close to or above the softening temperature of the part of the plastic strip facing the substrate;
- (v) pressing the plastic strip onto the substrate and where applicable breaking off the plastic strip and stopping it being led away, while the substrate and the cooling roll are connected by the plastic strip;
- (vi) coating the substrate with the plastic strip at high speed.

This achieves the effect of enabling a considerably thinner plastic layer to be applied onto the metal strip in a controlled and economically viable manner.

It is remarked that US 5,407,702 discloses a method for coating a metal strip with a polymer extrudate which extrudate after extrusion is firstly brought into contact with a surface having a temperature which will promote sticking or clinging of the extrudate thereto. A typical temperature for this purpose is said to be in the range of about 120 °C to 180 °C.

The invention is also embodied in an apparatus for the continuous strip-coating of a metal substrate with a layer of plastic.

Finally the invention is further embodied in a strip-coated packaging steel.

The invention will now be further illustrated by reference to the drawing comprising Figures 1, 2 and 3 each of which show a possible line drawing for coating in accordance with the invention, and several non-limitative examples with references to the Figures.

Example 1

An ECCS substrate (1) (also known as TFS) with a thickness of 0.20 mm. This

substrate is heated to a temperature of 230 °C by means of heating (2), for example comprising heated guide rolls and/or on the basis of induction, hot air or otherwise. A plastic strip (3) such as a PET plastic strip is produced by applying on each side of substrate (1) molten PET via nozzle (4), (4a) on an internally water-cooled guide roll (5), (5a). The cooled PET strip (3) is then conveyed to the rubber coated contact roll (6). As it travels it is possible to monitor the thickness, colour and strip tension and to trim to the correct width. The thickness of the two strips (3) is between 3 and 100 µm. Prior to commencement of coating the contact rolls (6) do not touch substrate (1), and the two strips are conveyed off, for example rolled up on winders (7).

In order to begin coating, contact rolls (6) are closed, i.e. moved towards substrate (1).

PET strips (3) adhere to substrate (1) and almost simultaneously the pieces of strip (3) between contact roll (6) and winder (7) are cut through. The rubber of rolls (6) is cooled externally, for example by metal cooling roll (8), or by an air-blade on the rubber surface. The coated strip is then subjected to a brief extra heat treatment to 260 °C in order to optimise adhesion. A good product results, particularly suitable for example for the covers of three-piece cans.

Example 2

As in Example 1 but now on the one side of substrate (1) the plastic flowing from nozzle (4a) is a two-layer polypropylene, whereby one of the layers, the adhesion layer, is maleic acid anhydride modified polypropylene; on the other side of the substrate a PET strip is manufactured and supplied via nozzle (4) and cooling roll (5). In this case the preheating temperature of substrate (1) is 200 °C. The thickness of the two strips is between 3 and 100 µm. During the initial contact of the two-layer strip with the substrate

AMENDED SHEET

at 200 °C, a temperature above the melting temperature of polypropylene, there is already some adhesion onto substrate (1), while the polypropylene top layer neither sticks to or is damaged by the rubber of contact roll (6) that has a temperature of approx. 90 °C. This adhesion to substrate (1) attains its maximum after approx. 1 second. The coated strip is then subjected to a brief extra heat treatment, for example to 260 °C, in order to optimise the adhesion of both PET and modified PP. A product results, for example particularly suitable for beer bottle crown closures.

Example 3

As in example 1 but now both plastic strips are two-layer polypropylene. Substrate (1) is 0.10 mm thick ECCS and is heated to a temperature of 230 °C. Now a product results with a PP layer on both sides. The higher temperature than in example 2 is necessary because of the low heat content of thin substrate. The product is particularly suitable for example for animal food packaging.

Figures 1, 2 and 3 show different line drawings in accordance with the invention of coating a metal substrate with an in-line manufactured plastic strip. Fig. 2 shows a vacuum chamber (20), an electrostatic edge limiter (9), an air-blade (10) for cooling, a thickness gauge (11), an edging knife (12), a cutting waste extractor installation (13), a temperature gauge (14) and a furnace (15) for heating the coated strip.

It is possible to stretch the plastic strip at a temperature above the glass transition temperature and below the softening temperature of the plastic; in the case of uni-axial stretching an elongation of up to 400% is conceivable. If desired it is possible to provide the plastic strip with openings.

To the expert it will be clear that the invention can be applied for single-side or two-side coating of a metallic substrate with on each side the same plastic, or a different

plastic for example PET or polypropylene or on one side polypropylene and on the other side PET.

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CLAIMS

1. Method for strip-coating a metallic strip-shaped substrate with a strip of plastic comprising the successive stages
 - (i) in-situ casting of a plastic strip;
 - (ii) leading the plastic strip around a preferably internally water-cooled cooling roll;
 - (iii) leading away the plastic strip between an opened contact roll and the substrate until the plastic strip production is underway and stabilised;
 - (iv) bringing the plastic strip and the substrate up to speed and heating the substrate to a temperature of the substrate close to or above the softening temperature of the part of the plastic strip facing the substrate;
 - (v) pressing the plastic strip onto the substrate by closing the contact roll and where applicable breaking off the plastic strip and stopping it being led away, while the substrate and the cooling roll are connected by the plastic strip;
 - (vi) coating the substrate with the plastic strip at high speed;while performing on the plastic strip as it travels between cooling roll and contact roll at least one of monitoring its thickness, monitoring its colour, monitoring strip tension and trimming its width.
2. Method in accordance with Claim 1, characterised in that after the plastic strip has been applied an extra heat treatment stage follows in order to improve adhesion.
3. Apparatus for strip-coating a metallic strip-shaped substrate with a strip of plastic

in accordance with claim 1, comprising in combination:

- means of conveying the metal substrate;
- a contact roll for pressing the plastic strip onto the substrate;
- means of casting for casting the plastic;
- a cooling roll for the formation of a plastic strip;
- means of feeding and guiding for bringing the plastic strip to the substrate via the contact roll;

wherein the contact roll is movable to a first position apart from the substrate wherein it is suitably arranged to co-operate with a means of conveying off the plastic strip and to a second position relative to the substrate wherein it is suitable to press the plastic strip onto the substrate.

4. Apparatus in accordance with Claim 3, characterised in that the contact roll is rubber at least on a surface with which it comes into contact with the plastic strip.
5. Apparatus in accordance with Claims 3 or 4, characterised in that the means of conveying substrate, the contact roll, the means of casting, the cooling roll and the means of feeding and guiding are essentially duplicated, one set on each side of where the substrate is situated during operation for simultaneously two-sided coating the substrate.

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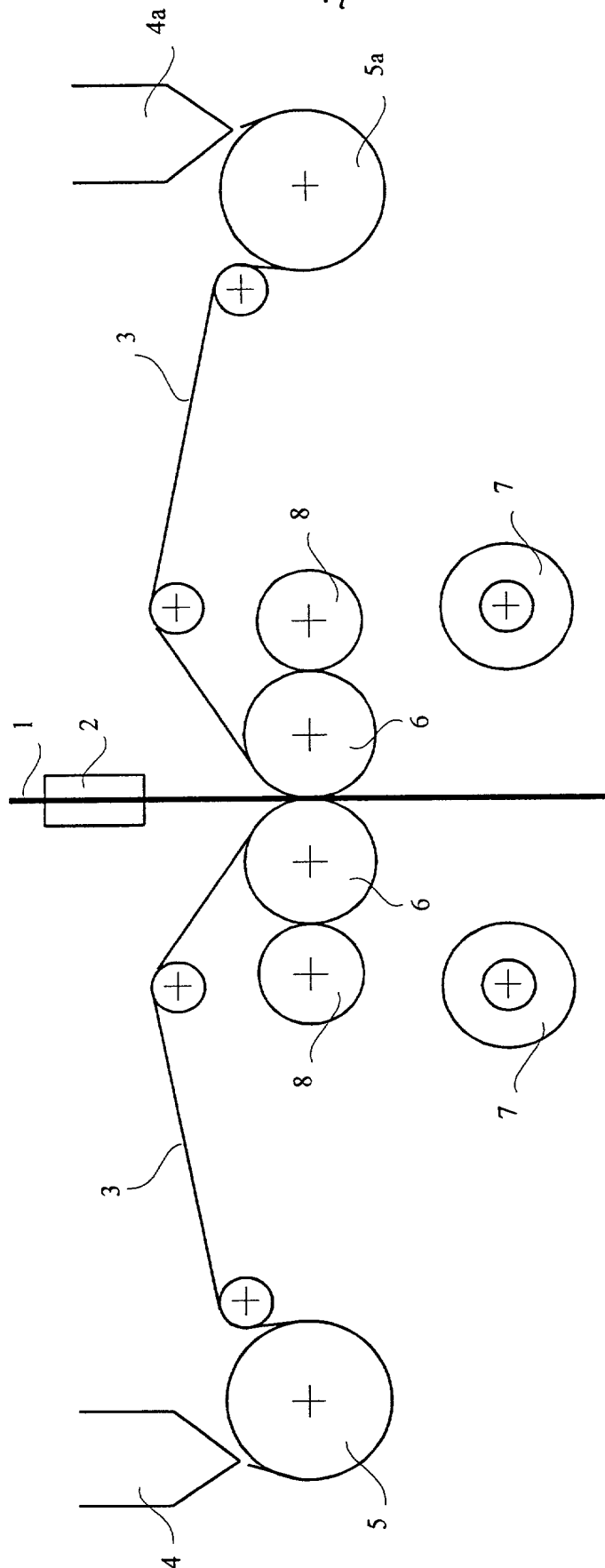


Fig.1

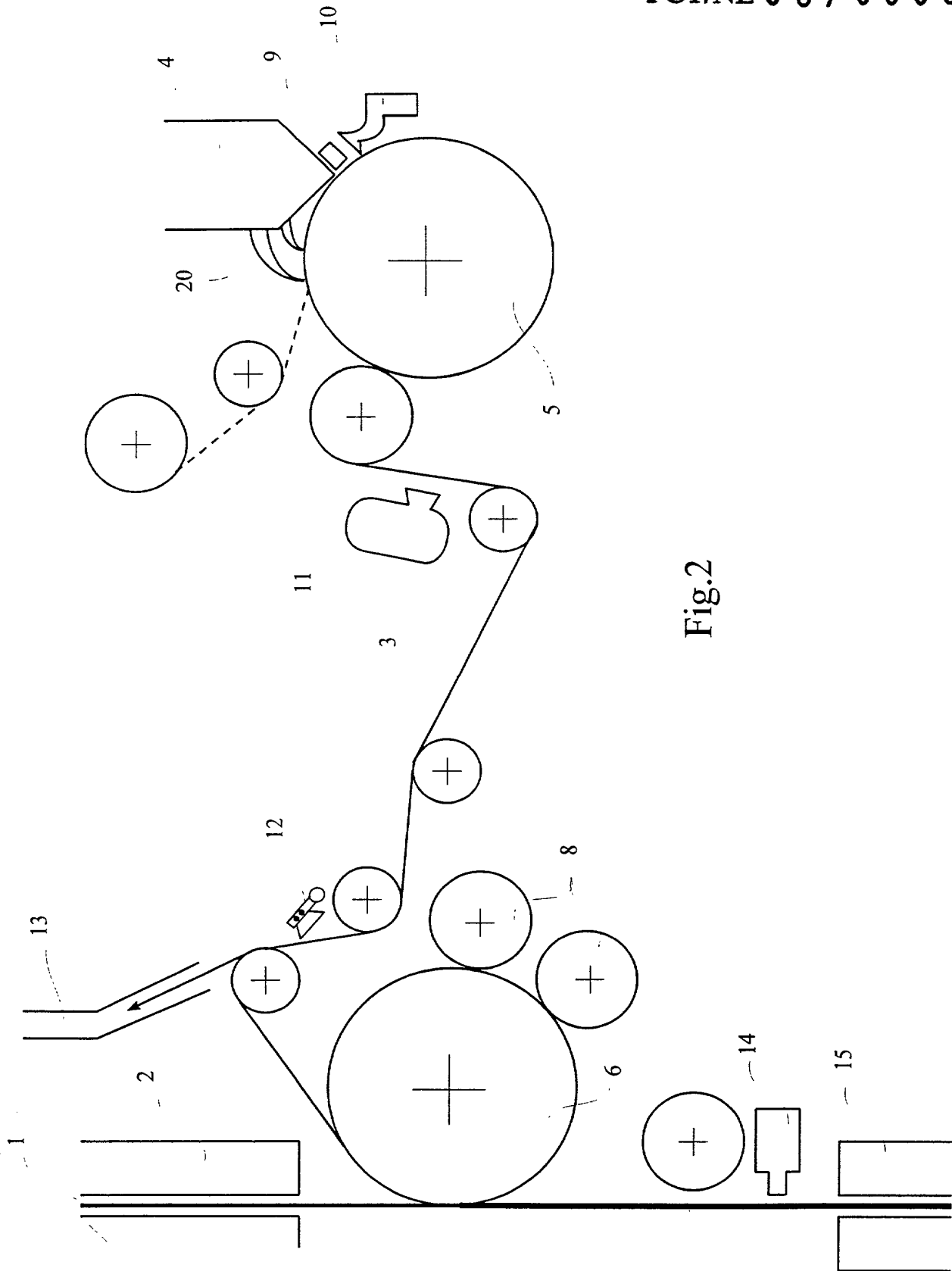


Fig.2

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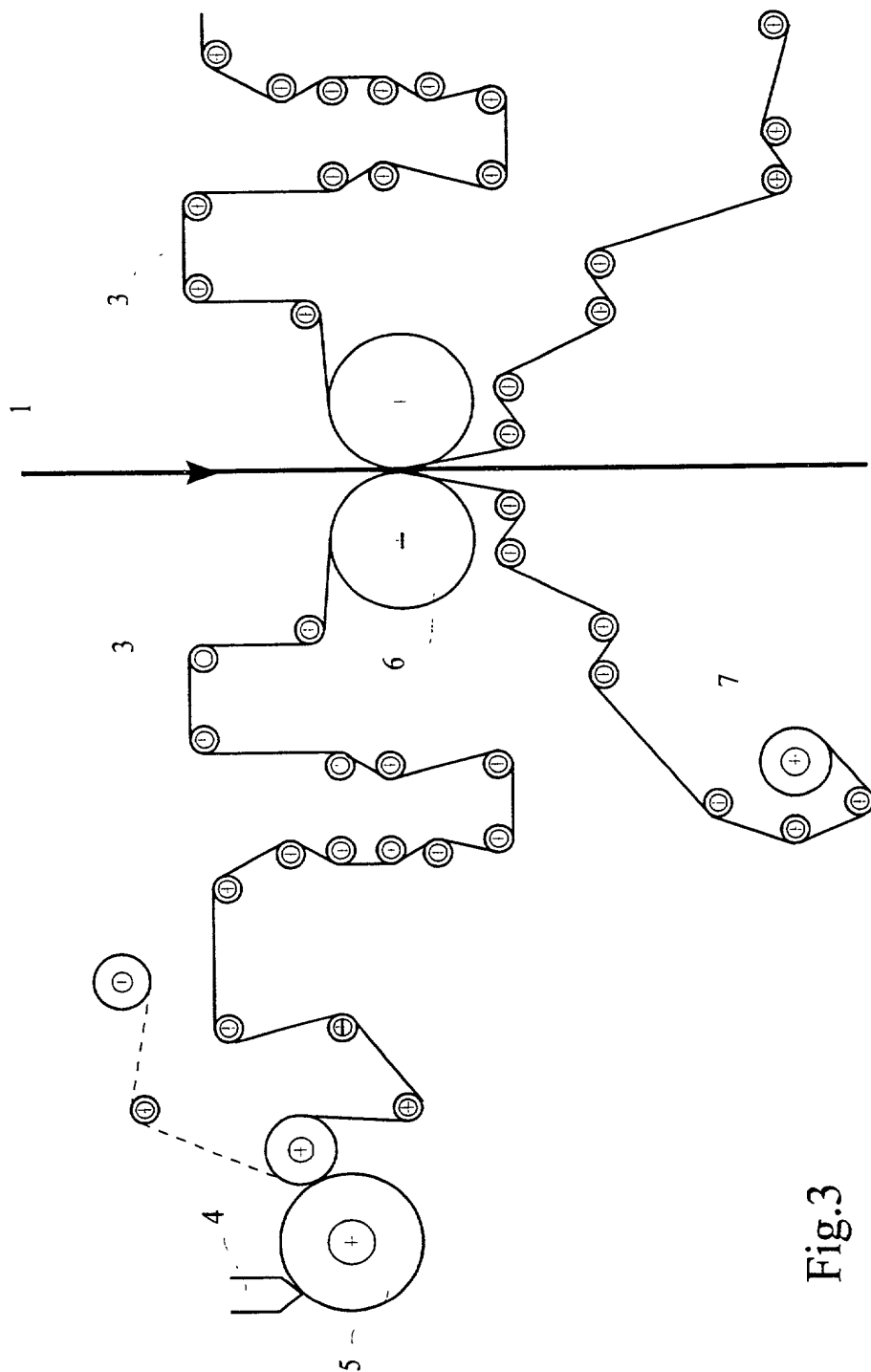


Fig.3

COMBINED DECLARATION AND POWER OF ATTORNEY FOR
UTILITY PATENT APPLICATION (Includes PCT)

Attorney Docket No.
APV 30918

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;
that

I believe I am the original, first and sole inventor (if only one name is listed below)
or an original, first and joint inventor (if plural inventors are listed below) of the
subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND APPARATUS FOR STRIP-COATING A METALLIC STRIP-SHAPED SUBSTRATE
WITH A PLASTIC BAND AND STRIP TEUS OBTAINED

the specification of which (check one)

☐ is attached hereto.

☐ was filed on _____ as Application Serial No. _____

and was amended on _____
(if applicable)

☒ was filed as PCT International Application No. PCT/NL98/00051 on January 23, 1998 and
was filed on July 15, 1999 as U.S. Patent Application No. 09/341,637.

I hereby state that I have reviewed and understand the contents of the above identified
specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this
application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I do not know and do not believe the claimed invention was ever known or used in the United
States of America before my or our invention thereof, or patented or described in any printed
publication in any country before my or our invention thereof or more than one year prior to
this application, that the same was not in public use or on sale in the United States of
America more than one year prior to this application, that the invention has not been
patented or made the subject of an inventor's certificate issued before the date of this
application in any country foreign to the United States of America on an application filed
by me or my legal representatives or assigns more than twelve months prior to this
application.

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any
foreign application(s) and United States provisional applications for patent or inventor's
certificate listed below and have also identified below any foreign application for patent
or inventor's certificate having a filing date before that of the application(s) on which
priority is claimed:

Prior Foreign and U.S. Provisional Application(s)			Priority Claimed	
<u>1005066</u>	<u>The Netherlands</u>	<u>23 January 1997</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	Day/Month/Year Filed	Yes	No
<u>1005304</u>	<u>The Netherlands</u>	<u>18 February 1997</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	Day/Month/Year Filed	Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No. Filing Date

Status

(patented, pending, abandoned)

Application Serial No. Filing Date

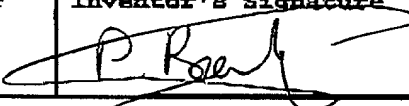
Status

(patented, pending, abandoned)

3 I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith; Stevens, Davis, Miller & Mosher, L.L.P.; Anthony P. Vanturino, Reg. No. 31,674; James E. Leadbetter, Reg. No. 28,732; and Thomas F. Pavelko, Reg. No. 31,689. Direct all telephone calls to telephone no. (202) 785-0100 and faxes to (202) 202-408-5200.

Address all correspondence to 1615 L Street, N.W., Suite 850, Washington, D.C. 20036.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole, First Inventor <u>Petrus Cornelis Jozef</u> <u>BEENTJES</u>	Inventor's Signature 	Date <u>August 30th 1999</u>
Residence: <u>Castricum, The Netherlands</u> <u>NLX</u>		Citizenship <u>NL</u>
Post Office Address: <u>Cieweg 43, NL-1902 AA Castricum, The Netherlands</u>		